Defining vocal quality in female classical singers: 
pedagogical, acoustical and perceptual studies

Helen Mitchell

BA Hons (Oxon)

A thesis submitted in fulfilment
of requirements for the degree of
Doctor of Philosophy

Australian Centre for Applied Research in Music Performance

Sydney Conservatorium of Music

University of Sydney

2005
Declaration

I, Helen Mitchell, hereby declare that this submission is my own work and that it contains no material previously published or written by another person except for co-authored publications submitted and where acknowledged in the text. It does not contain material that has been accepted for the award of a higher degree.

In addition, ethical approval from The University of Sydney Human Ethics Committee was granted for the studies presented in this thesis. Subjects were required to read a subject information document and informed consent was gained prior to data collection.

Signed: ___________________________ Date: __________________

Supervisor’s signature: ___________________________ Date: __________________

Supervisor’s certification

I certify the thesis of Helen Mitchell ‘Defining vocal quality in female classical singers: pedagogical, acoustical and perceptual studies’ to be suitable for examination.

Signed: ___________________________ Date: __________________
Acknowledgements

The greatest thanks to my supervisor A/Professor Dianna Kenny, for her consistent and unfailing support and availability, expert guidance in assisting me to conceptualise the research questions, develop the methodologies to test them and undertake the statistical analyses, for her level headedness, for steering this thesis through troubled waters and keeping me on track during difficult times, for giving me confidence in my ideas and judgments, and for reading my drafts and editing them many, many times until they reached the standard required for publication in international refereed journals. Without her constancy, persistence and dedication, this thesis would not have been completed.

Support at the Conservatorium and The University has extended from the pedagogical to the technical. Thanks to Maree Ryan for her invaluable pedagogical advice and knowledge in supporting the projects. I would also like to thank Peter Thomas, Keith Griffin and Dr Densil Cabrera for their time, patience, support and expert knowledge, especially for technical advice and knowledge of acoustics.

Sincere thanks to The Northcote Trust, who supported me throughout my three years in Australia and made my doctoral studies possible. Thanks to Associate Professor Pamela Davis for her encouragement in my initial application to the National Voice Centre.

Sincere thanks to my mum, Frances, for her unfailing support from afar, cross-time line phone calls and emails. And of course, colleagues, friends and students at The Women’s College, my home away from home, support network and vast adopted extended family for the last three years.

To friends who cannot be listed individually who have taken an interest in the singing world, and offered more titles for this thesis than can ever be published.

To the singers and listeners who gave so generously of their time and skill to make these studies possible, I also offer my sincere thanks.
Abstract

The technique of “open throat” is a pedagogical concept transmitted through the oral tradition of singing. This thesis explored the pedagogical perceptions and practices of “open throat” using empirical methodologies to assess technical skill and associated vocal quality. In the first study (Mitchell, Kenny, Ryan, & Davis, 2003), we assessed the degree of consensus amongst singing pedagogues regarding the definition of, and use in the singing studio of the technique called “open throat.” Results indicated that all fifteen pedagogues described “open throat” technique as fundamental to singing training and were positive about the sound quality it achieved, especially in classical singing. It was described as a way of maximising pharyngeal space or abducting the false vocal folds. Hypotheses generated from pedagogical beliefs expressed in this first study were then tested acoustically (Mitchell & Kenny, 2004a, 2004b). Six advanced singing students sang in two conditions: ‘optimal’ (O), using maximal open throat, ‘sub-optimal’ (SO), using reduced open throat and loud sub-optimal (LSO) to control for the effect of loudness. From these recordings, acoustic characteristics of vibrato (Mitchell & Kenny, 2004b) and energy distribution (Mitchell & Kenny, 2004a) were examined. Subsequent investigations of the vibrato parameters of rate, extent and onset, revealed that extent was significantly reduced and onset increased when singers did not use the technique. As inconsistent vibrato is considered indicative of poor singing, it was hypothesized that testing the energy distribution in these singers’ voices in each condition would identify the timbral changes associated with open throat. Visual inspection of long term average spectra (LTAS) confirmed differences between O and SO, but conventional measures applied to long term average spectra (LTAS), comparing
energy peak height [singing power ratio (SPR)] and peak area [energy ratio (ER)] were not sensitive to the changes identified through visual inspection of the LTAS. These results were not consistent with the vibrato findings and suggest that conventional measures of SPR and ER are not sufficiently sensitive to evaluate LTAS. In the fourth study, fifteen expert listeners consistently and reliably identified the presence of open throat technique with 87% accuracy (Mitchell & Kenny, in press). In the fifth study, LTAS measurements were examined with respect to the perceptual ratings of singers. There was no relationship between perceptual rankings of vocal beauty and acoustic rankings of vocal quality (Kenny & Mitchell, 2004, in press). There is a vast literature of spectral energy definitions of good voice but the studies in this thesis have indicated that current acoustic methods are limited in defining vocal quality. They also suggest that current work in singing has not sufficiently incorporated perceptual ratings and descriptions of sound quality or the relationship between acoustic and perceptual factors with pedagogical practices.

References


# Table of Contents

1 **Overview of the thesis**  

1.1 Historical background to the thesis  

1.1.1 Singing style in the western classical tradition  

1.1.2 Classical voice quality  

1.1.2.1 Changing musical styles  

1.1.2.2 Singers rise to fame  

1.1.2.3 Virtuosity  

1.1.2.4 Changing accompaniments  

1.1.2.5 A new vocal style  

1.2 Empirical research in singing voice  

1.2.1 Vibrato  

1.2.2 Spectral energy  

1.2.2.1 Long term average spectra  

2 **Pedagogical directions**  

**REVIEW PAPER**  

3  Defining open throat

PAPER 1


3.1 Conclusion

4  Vibrato

PAPER 2


4.1 Conclusion

5  Long term average spectra

PAPER 3


5.1 Conclusion

6  Perceptual verification

PAPER 4

6.1 Conclusion

7 Vocal quality

PAPER 5


ICMPC8 CONFERENCE PROCEEDINGS


7.1 Conclusion

8 Overall conclusions and future directions

8.1 Review of the findings
8.2 Originality of the research
8.3 Limitations of the research
8.4 Future Directions
8.4.1 Establishing a gold standard
8.4.2 Recording techniques
8.4.3 Perceptual assessors
8.4.4 Integrating science into a systematic pedagogy

9 Conclusion

10 References
Appendices

APPENDICES FOR PAPER 1

Appendix A: Project 1 Ethics Proposal 156
Appendix B: Project 1 Subject Information Sheet 161
Appendix C: Project 1 Subject Consent Sheet 163
Appendix D: Project 1 Subject Questionnaire 164

APPENDICES FOR PAPERS 2 AND 3

Appendix E: Project 2 Ethics Proposal 169
Appendix F: Project 2 Singer Information Sheet 174
Appendix G: Project 2 Singer Consent Sheet 175
Appendix H: Project 2 Singer Questionnaire 176

APPENDICES FOR PAPER 2

Appendix I: Vibrato onset raw data 180
Appendix J: Vibrato extent raw data 186
Appendix K: Vibrato rate raw data 192

APPENDICES FOR PAPER 3

Appendix L: Long term average spectra raw data 199
Appendix M: Music and Gesture Abstract 211

APPENDICES FOR PAPERS 4 AND 5

Appendix N: Project 2 Pedagogue Information Sheet 214
Appendix O: Project 2 Pedagogue Consent Sheet 215
Appendix P: Project 2 Pedagogue Questionnaire 216
Appendix Q: Project 2 Pedagogue Listener Response Sheet 219
Appendix R: Pedagogue Listener Debrief Document 225
APPENDICES FOR PAPER 4 226
Appendix S: Perceptual judgments: messa di voce 227
APPENDICES FOR PAPER 5 232
Appendix T: Perceptual judgments: song samples 233
Appendix U: Perceptual LTAS 238
Appendix V: ICMPC8 Abstract 244
Appendix W: Summary of publications and presentations arising from the thesis 247